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ABSTRACT

In this study of 53 graduate students enrolled in an introductory course in educational research, the instructor employed strategies noted in the literature as effective in reducing anxiety in statistics classes: (1) addressing the anxiety; (2) using humor; (3) applying statistics to real world situations; (4) reducing fear of evaluation; and (5) encouraging students to work in cooperative groups. Students were asked to respond to a question about what the instructor did to reduce anxiety in the statistics class. The 86 responses could be classified into two groups: the teaching-related behaviors of the instructor; and the interpersonal style of the professor. Few responses related directly to strategies the instructor used to alleviate anxiety. In two focus groups of nine students, responses mirrored the written responses. The conclusion drawn from these findings is that students perceive specific teaching behaviors and the interpersonal style of the instructor as being helpful in reducing anxiety. Effective teaching behaviors included giving individual help, expressing concern about anxiety, breaking the material down into small steps, using humor, and giving the students activities to help them grasp the concepts. Interpersonal factors include having a positive attitude and being encouraging, reassuring, supportive, and calm. (Contains 2 tables and 19 references.) (Author/SLD)

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Running Head: STATISTICS ANXIETY REDUCTION: STUDENT RESPONSE

Student Response to a Systematic Program of Anxiety-Reducing Strategies in a Graduate-Level Introductory Educational Research Course

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Abstract

Anxiety about statistics can result in impaired performance, mental anguish, and avoidance of statistics courses needed for professional advancement. In this study of 53 graduate students enrolled in an introductory course in educational research, the instructor employed strategies noted in the literature as effective in reducing anxiety in statistics classes: addressing the anxiety, using humor, applying statistics to real-world situations, reducing fear of evaluation, and encouraging students to work in cooperative groups.

Students were asked to respond to the prompt: "What, if anything, did your instructor do to reduce anxiety in the statistics class?" The 86 responses could be classified into two groups: teaching-related behaviors of the instructor (44.2% of the responses) and the interpersonal style of the professor (55.8%). Few responses related directly to the strategies specifically employed by the instructor to alleviate anxiety. In two focus groups of nine students, responses mirrored the written responses.

The conclusion drawn from this study is that students perceive specific teaching behaviors and the interpersonal style of the instructor as being helpful in reducing anxiety in the educational research classroom. Effective teaching behaviors include giving individual help, expressing concern about anxiety, breaking down the material into small steps, using humor, and giving the students activities that help them grasp the concepts. Interpersonal factors include having a positive attitude and being encouraging, reassuring, supportive, and calm.

Student Response to a Systematic Program of Anxiety-Reducing Strategies in a Graduate-Level Introductory Educational Research Course

Professors of educational research are well aware of the high levels of anxiety, particularly anxiety about studying statistics, experienced by graduate students embarking on their first course in research. Mathematics anxiety, the "panic, helplessness, paralysis, and mental disorganization that arises among some people when they are required to solve a mathematics problem" (Hunt, 1985, p. 32), generalizes to statistics anxiety in the educational research classroom. With its milder forms, students experience emotional discomfort and performance impairment; in more extreme cases, students may avoid career-advancing graduate courses, including educational research, that require statistics (Richardson & Suinn, 1972).

Although there has not been a great deal of research on how teaching strategies affect anxiety in the educational research classroom, many researchers have suggested ways to alleviate anxiety. Among these strategies are the following: addressing the anxiety (Tobias, 1978 and 1991; Dillon, 1982; Hunt, 1985; Yager & Wilson, 1986), using humor (Smith, Anscough, Ettinger, & Nelson, 1971; Kosbab, 1989; Schacht & Stuart, 1990), applying statistics to real world situations (Yager & Wilson, 1986; Schacht & Stewart, 1992; Thompson, 1992; Stallings, 1993), reducing fear of evaluation (Hunt, 1985; Johnson, 1988; Kosbab, 1989), and encouraging students to work in small cooperative groups (Burton, 1984; Blum-Anderson, 1992; Mealey & Host, 1992).

Wilson (1998) found that a systematic program of employing the above strategies resulted in an decrease in anxiety, as measured by pretest and posttest scores of the Statistical Anxiety Rating Scale (Cruise & Wilkins, 1980). Analysis of a paired-samples *t*-test used to compare the

means of the pretest and posttest scores concluded that the differences in the total score and five of six factors (worth of statistics, interpretation anxiety, test and class anxiety, fear of asking for help, and fear of the statistics teacher) were significant at the .001 level. Difference in one factor (computation self-concept) was significant at the .01 level. All mean scores were reduced, denoting a reduction in anxiety, from the pretest to the posttest. Effect sizes (Cohen, 1988) ranged from low to medium for computation self-concept; medium for test and class anxiety, fear of asking for help, and fear of the statistics teacher; and medium to high for worth of statistics, interpretation anxiety, and the combined scores of the six factors. The intent of this study was to see how the students themselves perceived the anxiety-reducing strategies employed by the instructor.

Methodology

Participants

The participants in this study were 53 students enrolled in EDUC 514: Educational Research Methods, one of the core courses in Muskingum College's Master of Arts in Education program during Fall Term 1997. Included were 6 males and 47 females, with a mean age of 35.3. Thirty-five of the students attended class on the main campus; 18 attended class in a satellite location forty miles from the main campus. All but one were employed in teaching in elementary and secondary schools in southeastern Ohio. Fifty-two are Caucasian; one is African American. Mathematics experience in the group varied from having no college mathematics other than math for elementary teachers to having already taken a statistics course at the graduate level. The average participant had taken math for elementary teachers and one other mathematics course, usually college algebra.

Nine students from the target group participated in two focus groups. They included nine female students, four from the on-campus class and five from the class at the satellite location.

Procedures

During the seven weeks of the course, the instructor followed a systematic program of using the teaching strategies noted in the literature as helping to reduce anxiety about statistics. The instructor acknowledged the existence of anxiety by asking the students to do a one-minute reflection and sharing of feelings about the course on the first day of class, halfway through the course, and again at the end of the course. New concepts were prefaced with remarks about the perceived difficulty of the material. Student statements about their own personal stress levels were responded to with empathy on the part of the instructor.

Humor was introduced into the class with jokes and cartoons about statistics, research, and educators. Throughout the course, the humor became increasingly broad as the instructor gauged the responses of the students.

Few textbook examples were used to illustrate methodologies and statistical tests. Rather, examples were drawn from the professors's own research, from the students' own environments, and from current journal articles. The students' own research was "real world" in that they applied their new-found knowledge by doing action research in their own schools and school districts.

Anxiety about evaluation was reduced by assessing student work without administering a formal test. Rubrics were used to evaluate research proposals (one qualitative and one quantitative), a research project, two journal critiques, and three computer exercises involving using SPSS 8.0 for Windows to calculate descriptive statistics and to perform correlations.

ANOVAS, and independent sample and paired-sample *t*-tests.

Students worked in cooperative groups throughout the course, both in classroom activities and in the computer lab. In addition, groups of three students served as "support groups" for their peers in designing, implementing, and evaluating their research projects.

On the final day of class, students were asked to respond to the prompt: "What, if anything, did your instructor do to reduce anxiety in the statistics class?" Written responses were anonymous, and students were given as much time as desired to complete the task. Later, two focus groups of four and five students, selected at random from the larger group, were convened at the local coffee house. Students were asked by the graduate teaching assistant for the course to again describe what, if anything, the instructor did to reduce anxiety. They were then asked to respond specifically to each of the five strategies specifically employed by the instructor in order to reduce anxiety: acknowledgment of the anxiety, use of humor, application of methods to real-world situations, reduction of test anxiety, and cooperative learning. Responses were tape-recorded, and interview notes were taken by both the graduate assistant and the instructor, who was a silent observer. Each session lasted about an hour. Responses were coded and analyzed by the instructor.

Results

There were 86 responses to the prompt: "What, if anything, did your instructor do to reduce anxiety in the statistics class?" The responses were classified into two groups: teaching-related behaviors of the instructor (38 or 44.2% of the responses) and interpersonal style of the instructor (48 or 55.8%) . Responses are summarized in Table 1 and Table 2. Those behaviors specifically targeted in the study are marked with asterisks (*).

Table 1

Responses of Students to Prompt: Teaching-Related Behaviors

Response	Number	Percent
Gave individual help	9	10.5
Expressed concern about anxiety*	4	4.7
Broke material into small steps	4	4.7
Used humor in the classroom*	3	3.5
Used activities that helped me understand	3	3.5
Let me share work with peers*	2	2.3
Answered my questions	2	2.3
Gave a format for writing	2	2.3
Low test pressure*	1	1.2
Gave immediate feedback on grades*	1	1.2
Made suggestions for improvement	1	1.2
Modeled tasks	1	1.2
Asked for ideas and questions	1	1.2
Repeated important things	1	1.2
Gave good explanations	1	1.2
Used many examples	1	1.2
Put agenda on the board	1	1.2

Table 2

Responses of Students to Prompt: Interpersonal Style

Response	Number	Percent
Was reassuring/encouraging	18	20.9
Had a positive attitude	11	12.8
Was supportive	8	9.3
Was calm	7	8.1
Didn't make me feel dumb	1	1.2
Gave praise	1	1.2
Smiled a lot	1	1.2
Was informal, used first names	1	1.2

Of the 86 responses, only eight (9.3%) identified specific strategies systematically employed by the instructor in an effort to reduce anxiety.

In two focus groups of nine students, students were asked again to describe what the instructor did, if anything, to reduce their anxiety. Responses were similar to the open-ended questions. Most recognized were the positive attitude of the instructor, constant reassurance by the instructor, and the availability of individual help. An additional stress-reducer was the support of colleagues, not only in the classroom but in their schools and homes.

Participants in the focus groups were then asked to specifically address the use of each of the anxiety-reducing strategies. Many felt that the instructor's acknowledgment of their anxiety

was beneficial. However, it was pointed out that only as the class evolved and they were able to trust the instructor did they believe that she was really trying to reduce their anxiety. As one student put it, "Lots of teachers tell us that they know we're stressed, but then they go on and stress us out even more." Most of the participants also admitted that the one-minute sharing of ideas and feelings actually made them more anxious. They liked to hear what their colleagues had to share but were nervous about speaking to the group themselves.

One of the participants in the focus group said that she did not notice that there was any humor introduced into the classroom! Each of the others said that they enjoyed the attempts on the part of the instructor to lighten the mood with jokes and cartoons. They agreed that the broadest humor ("You know you're an educator...if you think there should be a Valium lick in the teachers' lounge," for example) received the most response.

Seven of the participants valued doing real research in their classrooms, but none were sure that doing so reduced their anxiety in the classroom. They did agree that use of the instructor's own research and class demographic data to explain inferential statistics did make the material easier to understand.

Four of the participants in the focus groups felt that test anxiety was replaced with "presentation anxiety" since they were required to present the results of their research in a conference simulation. Others felt that assessments other than formal testing did help to reduce their anxiety. There was general agreement that the writing assignments were difficult but with feedback from the instructor were at least possible.

Students felt comfortable with cooperative learning when they knew the other members and trusted them to do their share of the work and to "get the right answers." Cooperative

learning *caused* stress when other members were unknown, unable or unwilling to carry a reasonable part of the shared load, or "clueless" about what was expected. Those whose partners in the computer lab were more knowledgeable than they felt little anxiety in the lab; those whose partners were not more knowledgeable felt a great deal of anxiety. As one person said, "You get nervous when you see that everyone else is getting excited about making a histogram, and you can't even get the data entered."

Conclusions

In an earlier study (Wilson, 1998), it was determined that it *is* possible to reduce the anxiety of graduate students in the introductory educational research classroom. This study was an attempt to determine which, if any, of the strategies employed by the instructor specifically to reduce anxiety were recognized to do so by the students themselves: addressing the anxiety, using humor, applying statistics to real-world situations, reducing fear of evaluation, and encouraging students to work in cooperative groups.

An open-ended question asking, in general, what the instructor did to reduce anxiety, resulted in 86 responses, more than half of which referred to the interpersonal style of the instructor: positive attitude, reassuring, encouraging, supportive, and calm. Fewer than half referred to specific teaching behaviors: giving individual help, breaking the material into small steps, and providing activities that promote understanding of the material. Fewer than 10% referred to those strategies used specifically and systematically to attempt to reduce anxiety.

An analysis of responses of students in focus groups showed that few of the students realized that the instructor was consciously trying to reduce anxiety levels in the classroom. It is surprising that this group of students, who are themselves educators, were so thoroughly in the

role of anxiety-ridden student that they were unable to analyze and categorize the teaching strategies of their instructor.

The specific teaching strategies that students mentioned as reducing anxiety would be on most educators' lists of effective classroom behaviors. However, just employing effective teaching strategies is not enough to reduce anxiety in this high-stress arena. According to the students in this study, it is also necessary to exhibit what might be called encouraging behavior: reassuring them that they are able to learn the material and encouraging them in their attempts to complete the assignments. It appears that optimism is contagious and that support given by the instructor can help students make it successfully through what they initially view as an unpleasant--and perhaps undoable--course.

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